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**"LEPTOCERA LUTOSA": A COMPLEX OF NEARCTIC SPECIES**  
(DIPTERA, SPHAEROCERATIDAE)<sup>1</sup>

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For many years, identifications of Nearctic *Leptocera* have been based on the work of Spuler, published in a series of parts in several journals (1923-1925). One of the commonest and most widespread species recorded there was the European *Leptocera lutosa* (Stenhammar). Recently, among the American specimens which would be determined by Spuler's revision as *L. lutosa*, I recognized that there were several forms which were obviously distinct species from the modifications of the terminalia of the male, or of the female, or of both. To complicate the matter, none of these species agreed in certain details with the description of *lutosa* in the two latest European works on the family by Richards (Proc. Zool. Soc. London, 1930, p. 276) and Duda (1938, in Lindner's *Fliegen Palaeark. Region*, Lfg. 119, p. 78).

Upon studying the problem, I found that there are twelve new species in the complex, distinguished primarily on charac-

<sup>1</sup>I have followed the European workers Richards and Duda on the family name to replace the more familiar name Borboridae, though I am using the complete form Sphaeroceratidae rather than Sphaeroceridae. It is not within the province of this paper to present a lengthy discussion sufficient to explain the problems of the identity and status of *Musca subsultans* L. and the relation of the names *Cypsel*a Meigen, *Borborus* Meigen, *Sphaerocera* Latreille, and *Copromyza* Fallén, all of which have been used in forming family names for this group. Suffice it here to say that in my opinion *subsultans* must be regarded either as a phorid or as a *species incertae*, and that accordingly *Cypsel*a and *Borborus*, which have *subsultans* as type, need not concern us in determining the proper name for the family considered here.

<sup>2</sup>I am deeply indebted to Dr. O. W. Richards, of London, England, for his kindness in making available for comparative study a considerable number of Palaearctic species of the family. Without his fine cooperation, it would have been impossible to have reviewed the relationships of the American and European faunas. My thanks are also due to Dr. R. H. Beamer of the University of Kansas for the loan of the holotype of *Limosina atra* Adams.

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ters of the terminalia, though usually with some external features that aid in identification. It was thought for some time that the true *lutosa* did not occur in the Nearctic Region, but a few specimens were finally found. Perhaps more adequate material would show it to be reasonably common and well distributed in northern areas.

The "lutosa complex," as I choose to call it because most of the species will key out to *Leptocera lutosa* in Spuler's revision and because all of them are closely related to *lutosa*, includes those species involved in couplets 10-14 of Spuler's key (subgenus *Collinella*, 1924, Ent. Soc. Amer. Ann., vol. 17, pp. 107-108) except for the Neotropical species which are quite different and need not concern us here. The complex is distinguished from all other North American species of *Leptocera* by the following combination of characters:

Scutellum with bare disk and four pairs of marginal bristles, the basal pair weak; mesonotum with 4 to 5 pairs of strong dorsocentral bristles, the anterior pair just mesad of the humeri and arched mesad; face convexly developed and distinctly sinuose in profile, strongly tuberculate between the antennae; wing hyaline or evenly yellowish to light brown, never spotted or with brown areas along the veins.

In addition to the above, the following characters are common to the species involved and may help to segregate them from other *Leptocera* in cases where some of the above characters are damaged: One strong upcurved genal bristle and one short bristlelike hair behind it; wing venation approximately as figured for "*lutosa*" by Spuler (1924, i.e., pl. 18, fig. 1, opposite p. 116), usually with the outer posterior angle of the discal cell rounded and without trace of an appendage, though in a few species angulate and short appendiculate (*trochanterata*, *atra*, *cryptica*); first section of costa, up to the junction of the first vein, sparsely set with two rows of long, strong bristles; middle trochanter at the apex of the ventral surface with a long, strong, curved bristle directed toward the apex of the femur; middle metatarsus with a distinct ventral bristle midway, or nearer the base.

Body length has not been given for each species, for the range in size makes it of little significance in recognition. In general, however, the species fall into two groups:

Small species (1.5-2.25 mm.): *atra*, *spuleri*, *cryptica*.

Larger, bulky species (2.5-3.5 mm.): *trochanterata* (largest species, 3.5 mm.), *lutosa*, *michigana*, *urodela*, *forceps*, *barbata*, *tenaculata*, *richardsi*. The last two are the smallest in the group, and small males of *richardsi* may be only 2.25 mm. in length.

Too few specimens are available of *suberecta*, *latiforceps*, *melanderi*, and *omega* to make possible a general statement of size range, but they appear to fall in an intermediate range of 2.0-2.5 mm. Certainly they do not belong with *atra* and the other small species, nor are they the large, bulky type of *trochanterata* or *michigana*.

The terminology applied by different authors to the parts of male and female terminalia, particularly in the higher Diptera, is often a matter of considerable confusion to the reader. Several figures have been labeled to show the application of the terms used in this paper. The structures of the male fit in quite well with the figures and discussion by Crampton (1942, Conn. State Geol. and Nat. Hist. Survey, Bul. 64, pp. 70-165, and especially figure 13, drawings B-F).

*Male* (figs. 3, 9, 27): The apical segment of the male abdomen (= "second genital segment" of Sarcophagidae, etc.) is the *ninth tergite* (9t). This bears two processes on each side on its ventral margin: a *posterior lobe* (p. l.) that may be conical or subtruncate and is more or less thickly beset with long bristles or bristlelike hairs, and just anterior to the lobe a slender appendage which I call the *genital forceps* (f.) (= "genital hook" of Richards). In *Leptocera foreeps*, the forceps are peculiarly huge; in most of the other species they are short, slender, and curved. They correspond to the surstyli or edita of Crampton.

The last visible sternite of the male abdomen is the fourth sternite (4s), and the presence or absence of a median process on its posterior margin is an important specific character and one which can be applied without dissection of the abdomen. Posterior to the fourth sternite, and usually appearing as a narrow, weakly sclerotized pad, is what I interpret as the *fifth sternite* (5s). In one or two species, the ends are curved posteriorly, suggestive of the bilobed fifth sternite of some of the muscoid flies (Muscidae, Sarcophagidae). Between the last visible tergite (5) of the preabdomen and the ninth tergite are several sclerites which agree with Crampton's diagrams of the displaced sixth to eighth sternites twisting up the left side of the abdomen in a diagonal line. The asymmetrical *sixth sternite* (6s) is usually narrow, extending below the terminalia and part way up the left side, and is of interest because in two species (*richardsi* and *tenaculata*) it has two posteriorly directed processes which flank the midline and form what can be likened, in appearance at least, to a tenaculum or "catch." In other species there are no processes, but the straplike sternite is more or less U-shaped and forms a groove or pocket into which the genital organs slide in repose.

The gonapophyses or claspers, aedeagus and apodemes have been omitted in most cases in order to keep the drawings as simple as possible to direct attention to the characters used for specific differentiation. In several species, however, the *anterior clasper* (a.c.) and the *epiphallus*

(ep., = spinus titillitorius of Crampton) show the definitive specific characters and have been figured.

*Female*.—(figs. 36, 38): The end of the abdomen is more confusing and the parts less easily named than in the males. For present descriptive purposes, I have referred to the *dorsal plate* (d. pl.), which appears to be the eighth tergite, and the *lateral plates* (l. pl.), which are probably cerci. The last visible sternite is the *sixth sternite* (6s).

KEY TO THE NEARCTIC SPECIES OF THE "LUTOSA COMPLEX"

1. Hind trochanter ventrally with a patch of short, stout, black spines, 6-8 in females, 10-14 in males (fig. 6) ..... 1. *L. lutsoa* (Steuh.), p. 7  
 (Also the Palaearctic *L. lutosoidea* Duda; see discussion)
- Hind trochanter with fine hairs or sparse, ordinary setae, not with a patch of spines ..... 2
2. Dorsocentral bristles in four pairs, the usual second pair lacking; no acrostichal bristles developed, all hairs between the dorsocentrals approximately equal; third antennal segment distinctly reddish yellow on inner surface; mesonotum light gray with three usually rather distinct stripes, especially when viewed from behind ..... 2. *L. spuleri*, new species, p. 8
- Dorsocentral bristles in five pairs, the second usually weaker than the others; one or more pairs of acrostichals developed; third antennal segment black; mesonotum usually dark and not distinctly striped ..... 3
3. Halter entirely black or brown; all dorsocentral bristles subequal, the second nearly as strong as the others; almost always a median unpaired row of hairs on anterior half of notum between two strong pairs of acrostichals; discal cell angulate, and usually with a distinct appendage at outer posterior angle ..... 3. *L. atra* (Adams), p. 9
- Knob of halter pale lemon yellow; second dorsocentral bristle obviously shorter and weaker than the others; notum bare between the acrostichal bristles, rarely with an adventitious hair or two; discal cell rounded distally, except in *trochanterata* and *cryptica* ..... 4
4. Anterior half of mesonotum appearing densely haired, with 10-12 rows of fine, closely set setae between the dorsocentrals; outer posterior angle of discal cell usually angulate and appendiculate; relatively large, bulky species (3.5 mm.) ..... 5. *L. trochanterata* (Mall.), p. 11
- Anterior half of mesonotum relatively sparsely haired, with 8 rows of coarse, sparsely set setae between the dorsocentrals; outer posterior angle of discal cell rounded except in the much smaller *cryptica* ..... 5



5. Outer posterior angle of discal cell angulate and almost always with distinct appendage or stub of fifth vein; small species (1.75-2.25 mm.) .....	6. <i>L. cryptica</i> , new species, p. 12	
Distal end of discal cell rounded below, neither angulate nor appendiculate. ....		6
6. Males .....		7
Females (unknown for <i>suberecta</i> , <i>mclauderi</i> , <i>latiforceps</i> , and <i>omega</i> ) .....		17
7. Male terminalia huge, the genital foreeps long, strong, polished black, conspicuous even in dried specimens (figs. 4, 5) .....	4. <i>L. forceps</i> , new species, p. 10	
Male terminalia small to moderate in size, the genital foreeps not long and conspicuous .....		8
8. Hind tibia densely covered with strong erect bristles, including a row of long erect anteroventrals and unusually long anterodorsals (fig. 7) .....		9
Not so, anteroventral surface of hind tibia with only short appressed hairs, or at most with a partial row of suberect hairs that are barely equal to the diameter of the tibia; anterodorsals relatively short and weak, often little longer than the diameter of the tibia .....		11
9. Sixth sternite with two heavily sclerotized, thick, rounded processes that form a tenaculum or "catch"; padlike fifth sternite with ends recurved (fig. 27) .....	9. <i>L. tenaculata</i> , new species, p. 16	
Sixth sternite straplike, forming a narrow band beneath the genitalia; padlike fifth sternite not with ends recurved (fig. 28) .....		10
10. Posterior lobe with short hairs that are not conspicuously longer than hairs on other parts of the terminalia (fig. 9); epiphallus straight on distal portion (fig. 9); anterior clasper as figured (figs. 9, 14) .....	7. <i>L. michigana</i> , new species, p. 14	
Posterior lobe densely covered with long black hairs that are three times as long as width of lobe and twice the length of other hairs on terminalia (fig. 3); epiphallus curved anteriorly on distal portion (fig. 3); anterior clasper as figured (figs. 3, 15) .....	8. <i>L. barbata</i> , new species, p. 16	
11. Posterior margin of last visible sternite (IV) with a subtriangular process mesally .....	10. <i>L. urodela</i> , new species, p. 18	
Posterior margin of last visible sternite (IV) ordinary, without a median process though sometimes biblobed (figs. 28, 29) ...		12
12. Sixth sternite heavily sclerotized, on the midline with two posteriorly directed processes that appear to form a "catch" or tenaculum (fig. 1); genital foreeps strongly curved outward from the midline ...	11. <i>L. richardsi</i> , new species, p. 18	
Sixth sternite not so, usually narrow and straplike; genital foreeps slender and curved toward the midline .....		13

13. Posterior lobe acutely prolonged, with comparatively few long hairs; genital forceps slender, almost bristlelike (fig. 12) ..... 6. *L. cryptica*, new species, p. 12  
 Posterior lobe subtruncate or rounded, more or less densely haired; genital forceps broader, fingerlike to paddlelike ..... 14
14. Anterior clasper, in side view, formed of a subquadrate median portion with a fingerlike lateral process, in posteroventral view the median lobe longer than the lateral (figs. 13, 23) .... 15  
 Anterior clasper, in side view, deeply concave or U-shaped, appearing to have two long claws, in posteroventral view the outer lobe much longer than the inner (figs. 21, 22) ..... 16
15. Fifth sternite of regular form, approximately as figured for *michigana* (cf. fig. 28); epiphallus straight on its distal half (fig. 13); anterior clasper as figured (figs. 13, 16); hind tibia with a partial row of erect or suberect but short hairs on anteroventral surface ..... 12. *L. suberecta*, new species, p. 20  
 Fifth sternite noticeably thickened on each lateral third, suggestive of a bilobed appearance; epiphallus slightly curved distally, as in fig. 22; anterior clasper as figured (figs. 19, 23); hind tibia with appressed hairs on anteroventral surface ..... 13. *L. melanderi*, new species, p. 20
16. Genital forceps broad to apex (fig. 20); epiphallus straight on distal portion (fig. 21); anterior clasper as figured (figs. 17, 21) ..... 14. *L. latiforceps*, new species, p. 21  
 Genital forceps broad basally, tapering to the apex (fig. 25); epiphallus curved distally (fig. 22); anterior clasper as figured (figs. 18, 22) ..... 15. *L. omega*, new species, p. 21
17. Terminalia with a conspicuous, long, curled, taillike appendage (fig. 31) ..... 10. *L. urodela*, new species, p. 18  
 Not as described, never with taillike appendage ..... 18
18. Posterior margin of last visible sternite (6) produced at midline as a subtriangular flap (large and conspicuous in *michigana*, weak in *cryptica* and *tenaculata*) (fig. 40) ..... 19  
 Posterior margin of sixth sternite straight or slightly concave, not produced at midline ..... 21
19. Dorsal plate with a smooth and polished central area (fig. 36); lateral plate without a long strong bristle midway ..... 7. *L. michigana*, new species, p. 14  
 Dorsal plate entirely dull, gray pollinose, or at most narrowly polished at the extreme base (fig. 33) ..... 20
20. Dorsal plate strongly triangular in outline, the sides sloping (fig. 33) ..... 9. *L. tenaculata*, new species, p. 16  
 Dorsal plate as in *urodela* (cf. fig. 31), its outline almost subtruncate because the acute apex is but slightly extended at midline ..... 6. *L. cryptica*, new species, page 12

21. Dorsal plate distinctly demarcated, triangular to subtriangular (figs. 33, 34, 37) ..... 22  
 Dorsal plate as figured (fig. 35), not distinctly triangular, with a weakly sclerotized area centrally, and often more or less collapsed in drying ..... 11. *L. richardsi*, new species, p. 18
- 22.<sup>3</sup> Dorsal plate subeodate, with a smooth polished area at base (fig. 37) ..... 8. *L. barbata*, new species, p. 16  
 Dorsal plate distinctly angular, entirely gray pollinose except perhaps narrowly along base (figs. 33, 34) ..... 23
23. Outline of dorsal plate almost subtruncate, because apex is only slightly extended (as in fig. 31), the plate weak and often collapsed in drying; small species (1.75-2.25 mm.) ..... 6. *L. cryptica*, new species, p. 12  
 Dorsal plate distinctly triangular in outline, with sloping sides (figs. 33, 34), the plate strong and evident in all but extremely teneral specimens; larger species (2.5-3 mm.) ..... 24
24. Dorsal plate sagittate, strongly triangular (fig. 33) ..... 9. *L. tenaculata*, new species, p. 16  
 Dorsal plate laterally angulate, less strongly triangular than in *tenaculata* (fig. 34) ..... 4. *L. forceps*, new species, p. 10

1. *Leptocera lutosa* (Stenhammar) and *L. lutosoidea* Duda

Richards (1930, op. cit., p. 276) has recognized these two species under the names *palustris* Collin and *lutosa* Stenhammar. Duda (1938), however, maintained that the true *lutosa* was what Collin and Richards called *palustris*, and he proposed the name *lutosoidea* for *lutosa* in the sense of Collin and Richards. For present purposes, I have accepted the usage of Duda. Both species are distinguished from others in the "lutosa complex," and hence from all the new species described in this paper, by a patch of short black spines or spinelike setae on the ventral side of the hind trochanter (fig. 6).

I have seen only five Nearctic specimens with spined hind trochanter, and all are *L. lutosa* (Stenh.) in the sense of Duda

<sup>3</sup>The seven females before me that seem to belong with the males of *suberecta*, *melanderi*, *latiforceps*, and *omega* will run as far as couplet 22 in the key. The dorsal plate is distinctly angular, resembling that of *forceps* and *tenaculata*, but it is predominantly smooth and polished, usually only narrowly pollinose at the apex and along the sides. With so little information, it is not safe to assume that females of all four species come to this point in the key. Until females of the four have been determined with certainty, any females that pass beyond couplet 17 should be determined with some caution unless associated with males in adequate series.

(*palustris* Collin): 3 ♀ ♀, Matanuska, Alaska, May 3, 7, and 18, 1944 (J. C. Chamberlin); 1 ♂, Aweme, Manitoba, October 2, 1915 (N. Criddle); 1 ♀, Treesbank, Manitoba, October 28, 1915 (N. Criddle) [U.S.N.M.]. Relatively little far northern material has been available in this study, however, and both *lutosa* and *lutosoidea* may occur, and more commonly than these few records would indicate.

Richards has figured both male and female terminalia of the two species. Males of *lutosoidea* have the genital forceps large, curved, and broadly flattened to the apex ("subspatulate" of Richards); in *lutosa* the forceps are smaller, slender, and tapering to an acute apex. Females of the two species are quite similar and will probably have to be compared with figures, unless they are associated with males.

## 2. *Leptocera spuleri*, new species

(= *Leptocera trochanteratus* (Mall.) of Spuler, Ent. Soc. Amer. Annals, vol. 17, p. 107, 1924, not of Malloch).

With the characters given by Spuler for *trochanteratus* Malloch, and characterized especially by having only four pairs of dorsocentral bristles<sup>4</sup> and by the absence of acrostichal bristles, the anterior half of the mesonotum having 8-10 rows of acrostichal hairs with none outstanding, or so slightly as to be virtually unnoticeable. The chaetotaxy of the hind leg is like that described for *L. forceps*. This species was misidentified by Spuler, for the holotype of *trochanteratus*, in the U.S. National Museum, has five pairs of dorso-centrals and distinct acrostichal bristles.

Male terminalia: Small, sparsely set with short hairs, bright yellow on the ventral half; genital forceps slender, almost bristle like, weakly bisinuate, apically acute, black on the distal third; posterior margin of sternite IV concave, sternite V narrow and padlike.

Female terminalia: Dorsal plate with a transverse row of four closely set hairs near the middle, opposite and nearly in line with a long, curving bristle on each lateral plate, the latter approximately as in figure 30; hind margin of sixth sternite regular, not produced on the midline.

Type.—Male, U.S.N.M. No. 58906.

Holotype male and allotype, Many, Louisiana, July 6, 1933 (R. K. Nabours and C. W. Sabrosky), deposited in the U.S. National Museum. Paratypes [all U.S.N.M. except Kansas and Louisiana specimens in Sabrosky Colln.]: DISTRICT OF COLUMBIA: 1 ♂, Bennings, July 21 (J. M. Aldrich); 4 (2 ♂ ♂, 2 ♀ ♀), Rock Creek, August 3, 1913 and August 25,

<sup>4</sup>Spuler said three pairs of dorsocentrals, having called the anterior pair posthumeral.

1914 (R. C. Shannon); 1 ♂, "D. C." (Coquillett). FLORIDA: 1 ♀, Sarasota, March 2, 1937 (J. R. Malloch). GEORGIA: 1 ♀, Atlanta, June 25, 1945 (P. W. Fattig). INDIANA: 3(2 ♂ ♂, 1 ♀), Lafayette, May 24, 1915 and July 28 (Aldrich). KANSAS: 2(♂, ♀), Manhattan, June (♂) and September 25, 1932 (Sabrosky). LOUISIANA: 1 ♀, same data as type. MARYLAND: 2 ♀ ♀, "Md." June (Coquillett); 2 ♀ ♀, Plummer's Island, August 3 (R. P. Currie) and September 24, 1902 (Barber & Schwarz); 6(3 ♂ ♂, 3 ♀ ♀), Plummer's Island, July 31 and August 5, 1913, August 17, 1914 (Shannon); 5(1 ♂, 4 ♀ ♀), near Plummer's Island, August 5, 17, and 22, 1914, April 7, 1915 (Shannon); 2(♂, ♀), Cabin John, June 25, 1944 (W. E. Hoffmann); 1 ♂, Cupid's Bower Island, July 8, 1915 (Shannon); 1 ♂, Bladensburg, September 23, 1915 (Shannon); 10(3 ♂ ♂, 7 ♀ ♀), Hyattsville, September 1, 1912 (Knab and Malloch). MASSACHUSETTS: 1 ♂, Beverly, September 28, 1875 (Burgess). MEXICO: 1 ♀, Cordoba, Vera Cruz, April 25, 1908 (A. Fenyes). MISSISSIPPI: 2 ♂ ♂, Horn Island, June 16, 1944 (E. A. Richmond). PENNSYLVANIA: 1 ♀, Swarthmore, August 1908 (E. T. Cresson, Jr.). TEXAS: 2 ♀ ♀, Victoria, July 13, 1910 and July 17, 1914 (J. D. Mitchell). VIRGINIA: 1 ♂, Dead Run, Fairfax County, July 25, 1915 (Shannon).

The mesonotum is somewhat paler than in the other species of the complex, and is not obviously darker than the pleura. The three mesonotal stripes mentioned by Spuler vary considerably in distinctness, but it is usually clear that the mesonotum is not unicolorous. The third antennal segment is predominantly bright orange yellow on the inner surface, but the dorsal and apical margins may be somewhat infuscated.

### 3. *Leptocera atra* (Adams)

*Limosina atra* Adams, Kans. Univ. Sci. Bul., vol. 2, p. 223, 1903. (Kansas).

*Leptocera atra* (Adams) Spuler, Ent. Soc. Amer. Annals, vol. 17, pp. 108, 113, 1924. In part.

The holotype female, Douglas County, Kansas, July, "taken at electric light" (E. S. Tucker) [Kansas Univ. Colln.], runs fairly well in Spuler's key and agrees with his description. His determined material under the name *atra* is not always homogeneous, however. In particular there is confusion with *L. evanescens* (Tucker), probably because of reliance on the strong facial tubercle as a specific character, and with a new species described here (*cryptica*). The former has only two



pairs of scutellar bristles, however, and its separation from *atra* should never be difficult even with material in poor condition.

There are three good specific characters which will distinguish *atra* from all others in the group without recourse to terminalia: (1) the halter is entirely brown to black, (2) all five pairs of dorsocentral bristles are almost equally long and strong (in other words, the second dorsocentral is subequal to the others, instead of much weaker and shorter), and (3) there is a median unpaired row of short hairs on the anterior half of the notum between the two pairs of rather strong presutural acrostichal bristles. Of these characters, the first two are most reliable, for occasional specimens of *atra* lack the median row of hairs, and adventitious hairs may appear in the median position in other species, though rarely. The dark halter is a particularly useful character, because specimens submitted for determination, especially from general sweepings, are all too often badly denuded of bristles and hairs. Another feature shared by few other species (*trochanterata*, *cryptica*) is that the outer posterior corner of the discal cell is distinctly angulate, with a short stub or appendage.

Otherwise, *atra* possesses the characters listed for the "lutosa complex," and agrees with the general description of color and chaetotaxy given for *L. forceps*, except for the development of the second dorsocentral. The side view of the male terminalia has been figured (fig. 11) for comparison with *cryptica* and *trochanterata*.

Distribution: Widespread. I have identified specimens from Arizona, California, Colorado, Florida, Idaho, Kansas, Maryland, Michigan, Missouri, Montana, New Mexico, Oregon, South Dakota, Texas, Utah, Washington, and from Mexico City, Mexico.

#### 4. *Leptocera forceps*, new species

Black, densely gray pollinose, dark brownish gray above but lighter gray on the pleura; head entirely black, including antennae and mouthparts; legs with only the trochanters, knees narrowly, and mid and hind tarsi obscurely, reddish; abdomen bluish gray.

Interfrontal bristles typically five in each row, proclinate and slightly convergent, the anterior bristle weakest, the next two strong, the posterior somewhat weaker, sometimes the anterior bristle strong and the size of the five bristles decreasing from front to rear; mesonotum with five pairs of dorsocentral bristles, the second much shorter than the others; eight rows of acrostichal setae between the dorsocentrals on the anterior half of the mesonotum, the median pair of rows more widely separated than lateral rows and with several somewhat irregular

pairs of stronger, bristlelike setae (= acrostichal bristles), the strongest opposite the second and third dorsocentral bristles; preapical anteroventral bristles on hind femur weak and little longer than the clothing hairs; hind tibia with only appressed hairs on the anterior and anteroventral surfaces, and the anterodorsal and posterodorsal bristles weak and inconspicuous, little longer than the greatest diameter of the tibia.

Male terminalia as figured (figs. 4, 5), conspicuously enlarged, the abdomen appearing capitate; posterior lobe of ninth tergite elongate, acute; genital forceps strongly elongate, polished black, each bearing a long preapical bristle on its inner surface, the forceps conspicuous even in dried specimens; fourth sternite broad and long, strongly developed, with a number of long, erect black hairs and a toothlike projection on the posterior margin.

Female terminalia: dorsal view of apex of abdomen as figured (fig. 34), the dorsal plate almost flat, entirely gray pollinose, and with a distinctive sharply angled appearance that is evident even in dried specimens; last visible sternite (6) with hind margin ordinary, not produced on the midline.

Type.—Male, U.S.N.M. No. 58907.

Holotype male and allotype, Manhattan, Kansas, November 13, 1932 (C. W. Sabrosky), deposited in the U.S. National Museum. Paratypes: IDAHO: 1 ♂, Moscow, May 26, 1939 (T. A. Brindley); 1 ♀, Viola (J. M. Aldrich) [U.S.N.M.]. KANSAS: 13 (5 ♂ ♂, 8 ♀ ♀), same data as type; 14 (4 ♂ ♂, 10 ♀ ♀), Manhattan, March 17, 1935 (♂), March 27, April 9, and May 14, 1932 (4 ♀ ♀), September 28, 1934 (♂), October 10, 1934 (♂, 3 ♀ ♀), October 17, 1933 (♂, ♀), and October 20, 1931 (♀) (C. W. Sabrosky); 1 ♀, Manhattan, October 27, 1934 (R. C. Bushland) [Sabrosky Colln., Steyskal Colln., Snow Colln. of Univ. of Kansas, and U.S.N.M.]. NEVADA: 2 (♂, ♀), Soda Lakes near Hazen, July 13, 1911, "at fresh water seepage" (Aldrich) [U.S.N.M.]. OREGON: 1 ♀, Independence, August 1, 1934 (N. P. Larson) [Sabrosky Colln.]. TEXAS: 1 ♂, Dallas, (February 24, 1913 (F. C. Bishopp) [U.S.N.M.]. UTAH: 1 ♂, Corinne, August 31, 1948 (G. F. Knowlton, R. S. Bailey) [U.S.N.M.]. WASHINGTON: 1 ♀, Coulee City, September 3, 1920 (R. C. Shannon). [U.S.N.M.].

##### 5. *Leptocera trochanterata* (Malloch)

*Limosina trochanteratus* Malloch, U.S. Natl. Mus. Proc. vol. 44, p. 462, 1913. (Virginia)

Color and chaetotaxy as described for *L. forceps*, except as follows: 10-12 rows of fine, closely set acrostichal setae between the dorsocentrals on the anterior half of the mesonotum, the two median rows not strikingly farther apart than the

other rows, the mesonotum thus with a somewhat more densely haired appearance than in any of the other species; mesonotum dark but indistinctly three-striped when viewed from behind, the median vitta especially evident; outer posterior angle of the discal cell almost always angulate and usually with a short appendage, unlike the other species.

Male terminalia of moderate size, sparsely short haired; posterior lobe (fig. 10) not bluntly rounded apically but with a slender, acuminate apical prolongation; last visible sternite (4) in ventral aspect concave on the hind margin in general contour, but the middle fifth straight, with a semicircular flat area devoid of bristles or hairs, the hairs flanking each end of this area longer and closer together than elsewhere on the sternite (fig. 26, drawn from treated specimen but the characteristic appearance is visible also in dried specimens); fifth sternite narrow and padlike, somewhat as in *michigana* (cf. fig. 28).

Female terminalia (fig. 30): Dorsal plate rather flat, dull, entirely gray pollinose, not strikingly angulate or otherwise distinctive; each lateral plate midway on the upper margin with a conspicuously long, curved bristle; posterior margin of sixth sternite produced on the midline, approximately as figured for *michigana* but smaller (cf. fig. 40), in dried specimens the process usually appearing to end acutely because of fine hairs dried together.

Spuler (Ent. Soc. Amer. Annals, vol. 17, p. 107, 1924) misidentified the species, as I found from studying the holotype male in the U. S. National Museum. His concept of the species is described elsewhere in this paper as *L. spuleri*, new species.

The holotype was dissected, and the drawings of the male are from that specimen. Those of the female are from specimens that I associated with *trochanterata* males in other material.

Distribution: Apparently eastern United States. Besides the type from Rosslyn, Virginia, barely a dozen specimens are known to me, from Florida (Sarasota County), Indiana (Lafayette, and Dunes State Park in Porter County), Michigan (Nottawa, South Haven), Texas (Paris, Wolfe City), and Virginia (Dead Run in Fairfax County).

#### 6. *Leptocera cryptica*, new species

*Leptocera atra* (Adams) of Spuler, Ent. Soc. Amer. Annals, vol. 17, p. 108, 113, 1924, in part.

Color and chaetotaxy as described for *L. foreceps* except as follows: Interfrontal bristles typically four in each row, decreasing in size from front to rear.

Outer posterior angle of discal cell angulate, and with a short appendage.

Male terminalia small with slender bristlelike genital forceps, which are curved mesad; side view of ninth tergite as in fig. 12, the posterior lobe acutely prolonged, with a comparatively few long hairs, not densely haired; last visible sternite concave on the posterior margin in ventral aspect, almost bare at the midline but with numerous long hairs immediately laterad of the midline, similar to but not quite as dense as in *trochanterata* (cf. fig. 26).

Female terminalia, in dorsal view, almost as figured for *trochanterata* (cf. fig. 30), with the same dull gray pollinose dorsal plate, a pair of strong hairs on the plate, and a long posteriorly curving bristle midway on each lateral plate; outline of dorsal plate itself approximately like that of *urodela* (cf. fig. 31), apically acute but the sides not strongly sloping; last visible sternite (6) with a small, pale, triangular process on the hind margin at the midline, as in *trochanterata* but smaller and often appearing somewhat frayed.

Type.—Male, U.S.N.M. No. 58943.

Holotype male, Moscow, Idaho (J. M. Aldrich). Allotype, same locality, Oct. 12, 1907 (Aldrich). In the U.S. National Museum.

Paratypes [all in U.S.N.M. except Independence, Oregon, and Spanish Fork, Utah specimens in Sabrosky Colln.]:

COLORADO: 1 ♀, Ft. Collins, August 17, 1915 (Jones); 3 ♀ ♀, same loc., August 10, 13, 31, 1943 (M. A. Palmer, at light).

IDAHO: 5 ♀ ♀, same data as type; 6(2 ♂ ♂, 4 ♀ ♀), same data as allotype; 7(3 ♂ ♂, 4 ♀ ♀), Moscow, October 9, 1907 (Aldrich); 1 ♂, Potlatch, June 17, 1911 (Aldrich).

MANITOBA: 2 ♂ ♂, Treesbank, August 6, 1915 and Aweme, October 2, 1915 (N. Criddle).

NEVADA: 1 ♂, Double Spring, June 21, 1916 (H. G. Dyar).

OREGON: 1 ♀, South of Worden, July 1, 1935 (P. W. Oman); 1 ♀, Independence, July 25, 1934 (N. P. Larson).

UTAH: 1 ♂, Spanish Fork (D. Elmo Hardy).

WASHINGTON: 1 ♂, Friday Harbor; 3 ♂ ♂, South of Spokane, July 9, 1935 (Oman).

I have also seen examples of the species from Joseph, Utah, and San Mateo County, California, both determined by Spuler as *atra*, but these specimens are in too poor condition to be included in the type series.

One male from Sanilac County, Michigan, one female from North Branch, Michigan, and three females from Manhattan, Kansas, all collected by the writer, are very close to this species. There are some slight differences in the terminalia however, and I should prefer to see a good series of associated males and females before reaching a conclusion on whether they are *cryptica* or an eastern species or subspecies.

The species is weakly characterized in the sense that there are no peculiar or outstanding features that separate it from the other species of the group. Its small size, general habitus, and angulate discal cell remind one of *atra*, under which name most of the above specimens had previously been placed by Spuler, but it lacks the black halter, median unpaired row of acrostichal hairs, and strong second dorsocentral bristle characteristic of Adams' species. The real confusion may come with *richardsi*, and it will ordinarily be necessary to dissect the terminalia to be sure, though in males the tenaculum of *richardsi* will save that trouble on any dried specimens where it is visible. Females of *richardsi* have a different habitus in dorsal view (cf. fig. 35), and lack the median process on the sixth sternite, though the process is small in *cryptica* and may be overlooked or misjudged. *Richardsi* is slightly larger, as comparison of two series side by side will show, but this point is not definitive for an individual or few specimens.

As far as the terminalia are concerned, this species is practically only a diminutive form of *trochanterata*. The greater number of rows of acrostichals and much larger size of *trochanterata*, however, make any confusion impossible.

Virtually all specimens of *cryptica* will key out at couplet 5, but to guard against the possibility of misinterpretation, the species is again segregated under males and females farther on in the key, and it is keyed out twice under the female sex as insurance against misinterpretation of the presence or absence of a median process on the last visible sternite.

#### 7. *Leptocera michigana*, new species

Color and chaetotaxy as in *L. forceps* except as follows:

Interfrontal<sup>a</sup> bristles 4-5, decreasing in size from front to rear; hind tibia of male densely bristled, with a row of long, erect anteroventral bristles, which are nearly twice as long as the tibial diameter, 1-2 irregular rows of erect anterior bristles that are slightly shorter than the anteroventral, and a row of 5-6 long and unusually strong anterodorsal bristles, the longest well over twice the diameter of the tibia; postero-dorsal bristles of hind tibia strong and distinct, but only little over the tibial diameter and not conspicuous beside the other bristles; preapical anteroventral bristles on hind femur of male strong, nearly matching the anterodorsals of the hind tibia; hind femur and tibia of female with weak bristles, differing little from those of *forceps*.

Male terminalia as figured (figs. 8, 9), smaller and less conspicuous than in *forceps*, rather densely setose but without the long bristles of that species; hairs on posterior lobe not noticeably longer or denser than other hairs on the terminalia, and at most not over 1½-2 times the width of the lobe; genital forceps short and fingerlike, curved



mesad; last visible sternite (4) concave on posterior margin in ventral aspect, the marginal bristles long and strong on the sides, but the middle third densely beset with fine hairs, the densely haired appearance, especially at the sides, chiefly due to hairs on the anterior half of the padlike fifth sternite; sixth sternite heavily sclerotized but narrow, without tenacular processes.

Female terminalia (figs. 36, 38, 40) characterized by the strongly **convex dorsal** plate with polished black central area, flanked by 1-3 pairs of distinct setae, and by the subtriangular flaplike process on the hind margin of the sixth sternite, the process appearing shallowly grooved on the midline.

Type.—Male, U.S.N.M. No. 58908.

Holotype male and allotype, North Branch, Lapeer County, Michigan, May 27, 1939 (C. W. Sabrosky), deposited in the U. S. National Museum. Paratypes: CALIFORNIA: 1 ♂, Eureka, May 22 (H. S. Barber) [U.S.N.M.]. IDAHO: 9 (5 ♂ ♂, 4 ♀ ♀), Moscow, April 3, 1912 (Aldrich); 4 (3 ♂ ♂, 1 ♀); Viola (Aldrich) [U.S.N.M.]; 1 ♂, Potlatch [Mus. Compar. Zool.]. ILLINOIS: 3 (2 ♂ ♂, 1 ♀), Algonquin, August 8, 1895 [Mus. Compar. Zool.]. INDIANA: 5 (1 ♂, 4 ♀ ♀), Lafayette, April 27, 1918, May 27, 1915, and October 4 (Aldrich) [U.S.N.M.]. MAINE: 1 ♀, Bar Harbor, August 10 (C. W. Johnson); 1 ♂, South Poland, May 6, 1924 (R. C. Shannon) [U.S.N.M.]. MASSACHUSETTS: 3 (1 ♂, 2 ♀ ♀), Beverly, September 30 and October 4, 1875 (Burgess) [U.S.N.M.]. MICHIGAN: 11 (7 ♂ ♂, 4 ♀ ♀), same data as type; 3 (1 ♂, 2 ♀ ♀), Sanilac County, May 28, 1939; 2 (♂, ♀), Brevort, August 2, 1936; 1 ♀, Traverse City, July 9, 1941; 1 ♀, Midland, June 6-7, 1936; 1 ♀, Isle Royale, August 3-7, 1936; 24 (14 ♂ ♂, 10 ♀ ♀), East Lansing, October 5, 1939; 1 ♀, East Lansing, September 19, 1936 (all collected by C. W. Sabrosky); 2 ♀ ♀, East Lansing, July 8, 1936 and April 23, 1937 (E. J. Hansens); 1 ♀, Antrim County, June 24, 1939 (C. B. Dibble) [Sabrosky Colln.]; 10 (6 ♂ ♂, 4 ♀ ♀), Midland County, June 25, 1945, June 15 and July 13, 1938, July 25, 1936, August 17, 1941, August 25, 1937, and September 15, 1945 (R. R. Dreisbach); 4 ♂ ♂, Lapeer County, May 27, 1939 (R. R. Dreisbach) [Dreisbach Colln.]; 5 (2 ♂ ♂, 3 ♀ ♀), Douglas Lake, Cheboygan County, July 30, 1928 (M. W. Boesel), June 26 and August 2, 1935, and August 8, 1927 (H. B. Hungerford) [Kansas Univ. Colln.]. NEW HAMPSHIRE: 3 ♂ ♂, White Mts. (Morrison); 1 ♂, Franconia Notch, July 8, 1931 (Aldrich) [U.S.N.M.]. NEW YORK: 2 ♀ ♀, West Nyack, July 11, 1920 (J. Bequaert) [Mus. Compar. Zool.]. OREGON: 1 ♀, Cascadia, August 11, 1924 (H. A. Scullen) [Sa-

brosky Colln.]; 11 (7 ♂♂, 4 ♀♀), Mt. Hood, July 13, 1932 (Aldrich) [U.S.N.M.]. PENNSYLVANIA: 1 ♂, State College, September 5, 1948 (Sabrosky) [Sabrosky Colln.]. SOUTH DAKOTA: 2 ♂♂, Rapid City, August 4, 1924 (F. M. Hull) [Sabrosky Colln.]. UTAH: 1 ♂, Consumers, September 15, 1931 [Sabrosky Colln.]. WASHINGTON: 1 ♂, Seattle (Aldrich); 2 ♂♂, Hoquiam, May 27, 1917 (H. G. Dyar) [U.S.N.M.].

#### 8. *Leptocera barbata*, new species

Color and chaetotaxy as described for *L. forceps*, except as follows: Hind tibia of male densely bristled, about as described for *L. michigana*, the anteroventral bristles slightly longer, nearly three times the diameter of the tibia.

Male terminalia of moderate size; tergite 9 partly reddish; posterior lobe black, densely covered with long, outstanding hairs that are three times as long as the width of the lobe and twice as long as other hairs on the terminalia (fig. 3); posterior aspect nearly as figured for *michigana*, except for the longer hairs on the posterior lobe; last visible sternite (4) as described and figured for *michigana*, the hind margin not as deeply emarginate as in that species; sternite V short and narrow, forming an inconspicuous pad close to the midline; sternite VI heavily sclerotized, broadly flattened, with no processes forming a tenaculum-like structure.

Female terminalia: Dorsal aspect of end of abdomen somewhat like that of *michigana*, but the dorsal plate narrower basally, and the smooth central polished area not as large or distinct (fig. 37); posterior margin of sixth sternite regular, not produced on the midline.

Type.—Male, U.S.N.M. No. 58909.

Holotype male and allotype, Isle Royale, Michigan, August 3-7, 1936 (C. W. Sabrosky), deposited in the U. S. National Museum. Paratypes: 2 (♂, ♀), same data as type [Sabrosky Colln.]; 1 ♀, Midland County, September 15, 1945 (R. R. Dreisbach) [Dreisbach Colln.]; 2 ♀♀, Franconia, New Hampshire (Mrs. Slosson) [U.S.N.M.]; 2 ♀♀, Matanuska, Alaska, May 10, 1944 (J. C. Chamberlin) [U.S.N.M.].

The male terminalia are very similar to those of *michigana*, but the densely long haired posterior lobe is quite distinct from that species. In the female sex, the absence of a median process on the posterior margin of the sixth sternite will distinguish *barbata* from *michigana*. These two species seem to be closely related; they share the feature of densely bristled hind tibia of the males.

#### 9. *Leptocera tenaculata*, new species

Color and chaetotaxy as described for *L. forceps* except for the interfrontal bristles and the chaetotaxy of the hind femur

and hind tibia which are as described for *L. michigana*, the hind tibia with the same appearance of numerous long erect anteroventral and anterior bristles.

Male terminalia superficially quite similar to those of *michigana*, the side view as figured for that species (cf. fig. 9) except for slightly longer and less curved genital forceps and the lateral processes on the fifth sternite; posterior aspect as figured for *michigana*, except for modifications of sternites V and VI (fig. 27), the fifth with the ends recurved and the sixth heavily sclerotized, polished black, with two thick rounded processes that form a sort of tenaculum or "catch," like that of *richardsi* but the processes widely separated; last visible sternite (4) concave on the posterior margin in ventral aspect.

Female terminalia (figs. 33, 39): Dorsal plate almost entirely dull, gray pollinose, narrowly polished along the base, its outline strongly triangular, apically acute, the disk convex, with one pair of distinct black hairs; posterior margin of sixth sternite with a pale triangular process at the midline, somewhat as figured for *michigana* but smaller; posterior aspect of the end of the abdomen, if distended, reveals a large, thick, highly polished black sclerite which appears to form the ventral surface of the dorsal plate and whose anterior half projects ventrad at at right angles to the plate (fig. 39).

Type.—Male, U.S.N.M. No. 58942.

Holotype male and allotype, Smith River, California, July 17, 1930 (J. M. Aldrich). Paratypes: 1 ♀, same data as type; 1 ♀, same locality, July 27, 1932 (Aldrich); 4 (2 ♂ ♂, 2 ♀ ♀), Crescent City, California, July 10, 1930 (Aldrich); 1 ♂, Quilcene, Washington, August 16, 1910. [Wash. spm. in Mus. Compar. Zool.; others in U. S. National Museum].

In the male sex, the long erect bristles anteriorly on the hind tibia place this species near *michigana* and *barbata*, and in most cases it will probably be necessary to dissect the terminalia to be sure of the identity. The strong, tenaculum-like development of the sixth sternite is the outstanding feature of *tenaculata*. The only other species with a similar development is *richardsi*, but the latter should never be confused here for it lacks the erect bristles on the hind tibia and the tenacular processes on sternite 6 are rather acute, relatively close together, and frequently visible in dried specimens.

The female of *tenaculata* resembles *michigana*, *trochanterata* and *cryptica* in having a median triangular process on the posterior margin of the fifth sternite, but differs from any of those species by its acutely triangular dorsal plate. A unique feature that can be seen if the genitalia are distended is the shining black L-shaped plate which seems to line the upper half of the inner surface of the end of the abdomen (fig. 39).

10. *Leptocera urodela*, new species

Color and chaetotaxy as described for *L. forceps*, except as follows: Anterodorsal and posterodorsal bristles on hind tibia of moderate length, the longest nearly twice the diameter of the tibia.

Male terminalia not large, moderately thickly beset with long hairs; posterior aspect similar to that of *richardsi* (cf. fig. 1), but the genital forceps slender and directed meso-caudad, and the sixth sternite without tenacular processes; side view approximately as figured for *michigana* (cf. fig. 9) except for the form of the fourth sternite; last visible sternite (4) at midline of posterior margin with a subtriangular flaplike process, which in side view appears thin, acute, and sometimes curved dorsad at the apex, and in dried specimens appears black and strong.

Female terminalia (fig. 31); Dorsal plate almost flat, with a low median carina, sloping to the sides, in dorsal view its outline angular, somewhat resembling that of *L. forceps*, but a large central portion smooth, polished, and usually reddish to reddish brown; apical portion of terminalia produced into a long, curved, taillike appendage that is conspicuous in dried specimens; hind margin of sixth sternite appearing straight in dried specimens, but with a minute triangular projection at the midline in cleared specimens.

Type.—Male, U.S.N.M. No. 58910.

Holotype male and allotype, Moscow, Idaho, October 9, 1907 (J. M. Aldrich), in the U. S. National Museum. Paratypes: CALIFORNIA: 2 ♀ ♀, Sacramento, September 24, 1920 (C. M. Packard). COLORADO: 2 (♂, ♀), Cameron Pass, August 19-22, 1940, the female taken at 11,500 ft. (C. W. Sabrosky). IDAHO: 6 ♀ ♀, Moscow, September 12, 1906 and October 9 and 12, 1907 (Aldrich). KANSAS: 2 (♂, ♀), Manhattan, October 18, 1934 and November 13, 1932 (Sabrosky); 1 ♀, Garden City, November 6, 1934. NEVADA: 2 ♀ ♀, Winnemucca Lake, July 17, 1911 (Aldrich); 1 ♀, Pyramid Lake, July 16, 1911 (Aldrich). WASHINGTON: 1 ♀, Pullman (Melander); 2 ♀ ♀, Pullman, June 5, 1906 and August 16, 1907; 5 (1 ♂, 4 ♀ ♀), Stratford, July 4, 1920 (R. C. Shannon); 1 ♀, Ritzville, August 25, 1920 (Shannon); 3 (1 ♂, 2 ♀ ♀), Soap Lake, August 16, 1919 (A. C. Burrill); 3 (1 ♂, 2 ♀ ♀) Coulee City, September 3, 1920 (Shannon) [Kansas and Colorado paratypes in Sabrosky Colln.; 2 paratypes, Pullman, Washington, Museum of Comparative Zoology; others in U.S.N.M.].

11. *Leptocera richardsi*, new species

Color and chaetotaxy as described for *L. forceps* except as follows: Interfrontal bristles as in *michigana*; usually three pairs of acrostichals developed.

Male terminalia small, sparsely covered with moderately long hairs, at rest resembling *michigana*; genital forceps short, strikingly curved laterad (fig. 1); fourth sternite not densely clothed with hairs, and with a marginal row of evenly spaced bristles, the hind margin straight, not produced on the midline; fifth sternite weak or absent; sixth sternite heavily sclerotized and shining black, with two posteriorly directed processes that form a deep notch at the midline, appearing almost as a catch or tenaculum (often visible in dried specimens) (fig. 2).

Female terminalia (figs. 32, 35): In dried specimens, the dorsal plate entirely dull gray to brown gray pollinose, rather flattened, with a sub-triangular basal area weakly bounded by slightly depressed areas, the only distinctive feature being a pair of strong, convergent, posteriorly directed bristles arising on the dorsal plate; in cleared specimens, the appearance as in fig. 35, the depressed areas paler in color than the rest of the dorsal plate; sixth sternite with hind margin slightly concave at the midline, not produced as in *michigana*.

Type.—Male, U.S.N.M. No. 58911.

Holotype male, Manhattan, Kansas, June 1932 (C. W. Sabrosky). Allotype, same locality, June 22, 1932 (Sabrosky). Types deposited in the U. S. National Museum.

Paratypes: CALIFORNIA: 4 ♂♂, San Diego, November 18 and December 13, 1916 (H. G. Dyar) [U.S.N.M.]. INDIANA: 3(1 ♂, 2 ♀♀), Lafayette, May 27, 1915, September 5, and October 4 (J. M. Aldrich); 1 ♂, Dunes State Park, Porter County, June 3, 1947 (J. and W. Rapp) [U.S.N.M.]. KANSAS: 1 ♀, Ft. Leavenworth, July 11, 1946 (H. A. Dunn) [U.S.N.M.]; 3(1 ♂, 2 ♀♀), Belle Plaine, July 2, 1933 (R. K. Nabours, C. W. Sabrosky); 11(4 ♂♂, 7 ♀♀), Manhattan, June 10, 18, 22, July 2, and October 8, 1932, and October 10, 1934 (C. W. Sabrosky) [Sabrosky Colln.]. LOUISIANA: 1 ♀, Many, July 6, 1933 (Nabours and Sabrosky) [Sabrosky Colln.]; 1 ♂, Logansport, March 24, 1908 (E. S. Tucker) [U.S.N.M.]. MARYLAND: 1 ♀, Chesapeake Beach, September 8, 1920 (Aldrich); 1 ♂, Beltsville, June 25, 1915 (Shannon); 1 ♀, Bladensburg, September 23, 1915 (Shannon) [U.S.N.M.]. MICHIGAN: 3(2 ♂♂, 1 ♀), Midland, June 6-7, 1936 (Sabrosky); 8(2 ♂♂, 6 ♀♀), North Branch, May 27, 1939 (Sabrosky) [Sabrosky Colln.]; 8(1 ♂, 7 ♀♀), Detroit, June 10, 1943 (G. Steyskal); 1 ♀, Grosse Isle, Wayne County, September 7, 1947 (Steyskal) [Steyskal Colln.]; 1 ♀, Midland County, July 11, 1939 (R. R. Dreisbach); 1 ♀, Missaukee County, May 29, 1939 (Dreisbach) [Dreisbach Colln.]. NEVADA: 1 ♀, Double Spring, June 21, 1916 (H. G. Dyar) [U.S.N.M.]. NEW MEXICO: 3(1 ♂, 2 ♀♀), Socorro, 1916 (Williston) [U.S.N.M.]. TEXAS: 4(1 ♂, 3 ♀♀), "Texas" (Belgrave); 1 ♀, Devil's River, May 5, 1907 (F. C. Bishopp)



[U.S.N.M.].

The small terminalia suggest *L. michigana* but the species is smaller in size, the males lack the long, strong bristles on the hind femur and hind tibia, and the females do not have a median process on the hind margin of the last visible sternite. The extended forceps-like appearance shown in figure 35 can often be seen in dried specimens, if the terminalia are reasonably well extended, but if not evident, the general appearance may cause it to be confused with *L. cryptica*.

The species is named in honor of Dr. O. W. Richards of London, England, a leading authority on this family of flies.

#### 12. *Leptocera suberecta*, new species

Color and chaetotaxy as described for *L. forceps* except as follows: Interfrontals 4-5, decreasing in size from front to rear; preapical anteroventral bristles on hind femur strong; hind tibia with a partial row of erect or suberect short hairs anteroventrally, the longest subequal to the tibial diameter.

Male terminalia as figured (figs. 13, 16, 24), the posterior lobe subtruncate, genital forceps curved toward the midline and tapering to the apex, epiphallus straight on the apical portion, and anterior clasper as figured and described in key; fourth sternite concave on posterior margin in ventral aspect; fifth sternite narrow, padlike, regular in form (cf. fig. 28), the ends not curved or enlarged; sixth sternite ordinary, without tenacular processes.

Type.—Male, U.S.N.M. No. 58944.

Holotype male, Pingree Park, west of Ft. Collins, Colorado, August 13, 1934 (C. W. Sabrosky), deposited in the U. S. National Museum. Paratypes: COLORADO: 3 ♂♂, type locality, August 12, 13, and 14, 1934 (Sabrosky) [Sabrosky Colln.]; 1 ♂, Columbine Lake, June 2 (H. G. Dyar). CALIFORNIA: 1 ♂, Smith River, July 17, 1930 (J. M. Aldrich). WASHINGTON: 1 ♂, Clarkston, June 2, 1930 (Aldrich) [U.S.N.M.].

#### 13. *Leptocera melanderi*, new species

Color and chaetotaxy as described for *L. forceps* except as follows: Interfrontal bristles 4, decreasing in size from front to rear.

Male terminalia: Tergite 9 and posterior lobe approximately as figured for *suberecta* (fig. 13); genital forceps curved toward the midline, tapering to the apex; epiphallus long, slightly curved for its distal third; anterior clasper as figured (figs. 19, 23), resembling *suberecta* in having a subquadrate median portion with a slender fingerlike lateral process; fourth sternite concave on the posterior margin in ventral aspect, the fifth considerably thickened on each lateral third, producing a bilobed appearance; sixth sternite ordinary, without tenacular processes.

Type.—Male, U.S.N.M. No. 58945.

Holotype male, Friday Harbor, Washington, July 6, 1905, in the U. S. National Museum.

The species is named in honor of Dr. A. L. Melander, who has collected and named many acalypterate Diptera, and whose collection formed the basis for Spuler's work on *Leptocera* and the other genera of this family.

14. *Leptocera latiforceps*, new species

Color and chaetotaxy as described for *L. forceps*.

Male terminalia: Ninth tergite and posterior lobe, in side view, as figured for *suberecta* (cf. fig. 13); genital forceps like a curved paddle, broad to the apex (fig. 20); epiphallus straight for its apical portion; anterior clasper as figured (figs. 17, 21) and described in the key, in side view appearing as a two-lobed, clawlike structure; fourth sternite slightly bilobed, and the fifth with ends recurved (fig. 29); sixth sternite ordinary, without tenacular processes.

Type.—Male, U.S.N.M. No. 58946.

Holotype male, Terrace, British Columbia, April 1-7, 1933 (Mrs. M. E. Hippisley). Deposited in the U. S. National Museum.

Paratypes: 1 ♂, same data as type [Sabrosky Colln.]; 1 ♂, Stanford University, California, February 6, 1906 (J. M. Aldrich) [U.S.N.M.].

15. *Leptocera omega*, new species

Color and chaetotaxy as described for *L. forceps*.

Male terminalia: Ninth tergite and posterior lobe in side view similar to  *barbata* (cf. fig. 3), the lobe rounded and quite convex, and densely beset with long black hairs; genital forceps broad basally but narrow and tapering apically (fig. 25); epiphallus curved apically (fig. 22); anterior clasper as figured (figs. 18, 22) and described in the key, appearing in side view as a bilobed claw, as in *latiforceps*; fourth and fifth sternites as described for *latiforceps* (cf. fig. 29); sixth sternite ordinary, without tenacular processes.

Type.—Male, U.S.N.M. No. 58947.

Holotype male, Pingree Park, west of Ft. Collins, Colorado, August 14, 1934 (C. W. Sabrosky), deposited in the U. S. National Museum.

Paratypes: 2 ♂♂, same locality, August 12 and 14, 1934 (Sabrosky) [Sabrosky Colln.].

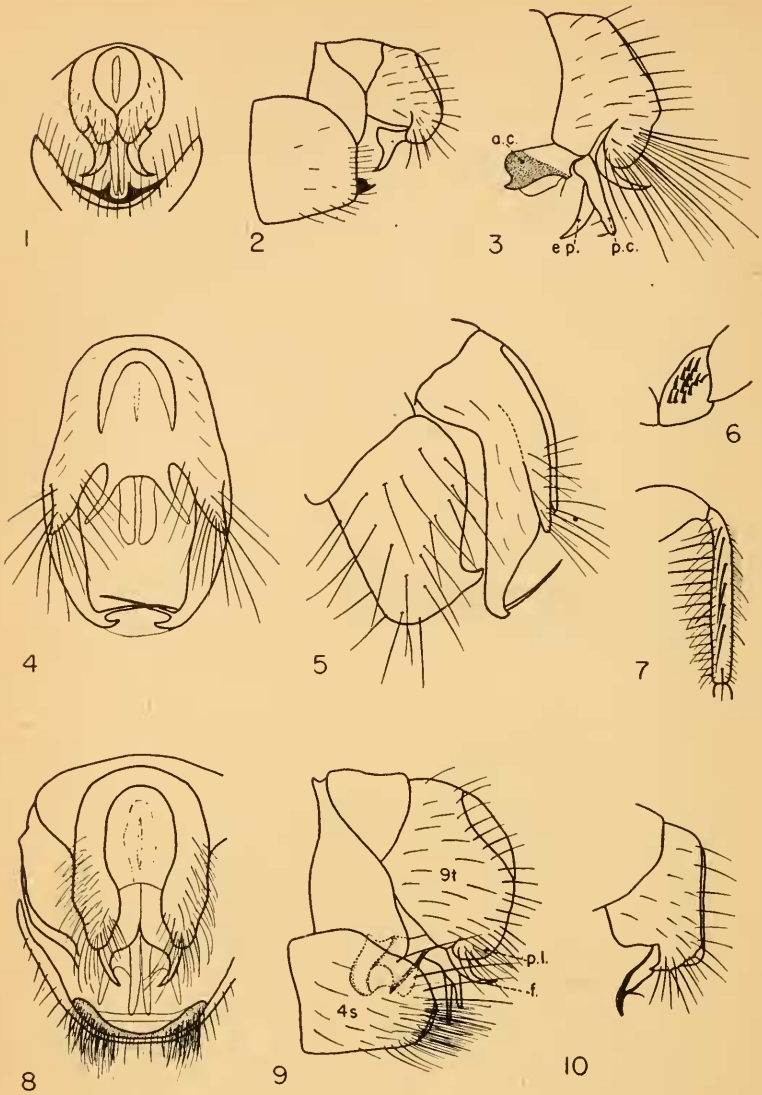


PLATE I. MALE CHARACTERS IN LEPTOCERA

Figs. 1, 4, 8, Posterior view of terminalia of *richardsi* (1), *forceps* (4), *michigana* (8); figs. 2, 3, 5, 9, 10, lateral view of terminalia of *richardsi* (2), *barbata* (3), *forceps* (5), *michigana* (9), and *trochanterata* (10); fig. 6, *lutosa* (Europe), ventral view of right hind trochanter; fig. 7, *michigana*, left hind tibia, outer or anterior aspect.

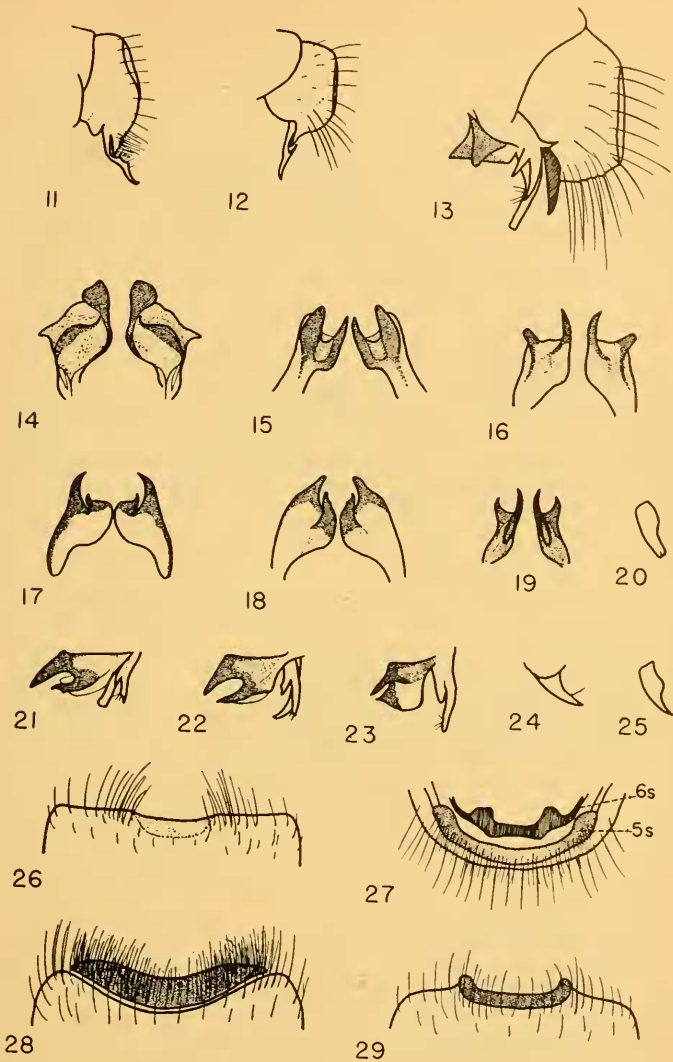


PLATE 2. MALE CHARACTERS IN LEPTOCERA

Figs. 11-13, lateral aspect of terminalia of *atra* (11), *cryptica* (12), and *suberecta* (13); figs. 14-19, posteroventral aspect of anterior claspers of *michigana* (14), *barbata* (15), *suberecta* (16), *latiforceps* (17), *omega* (18), and *melanderi* (19); figs. 21-23, left lateral aspect of anterior and posterior claspers of *latiforceps* (21), *omega* (22), and *melanderi* (23), (epiphallus also shown on figs. 21 and 22); figs. 20, 24, 25, genital forceps of *latiforceps* (20), *suberecta* (24), and *omega* (25); figs. 26-29, ventral to posteroventral aspect of sternites IV and V of *trochanterata* (26), *tenaculata* (27), *michigana* (28), and *latiforceps* (29).

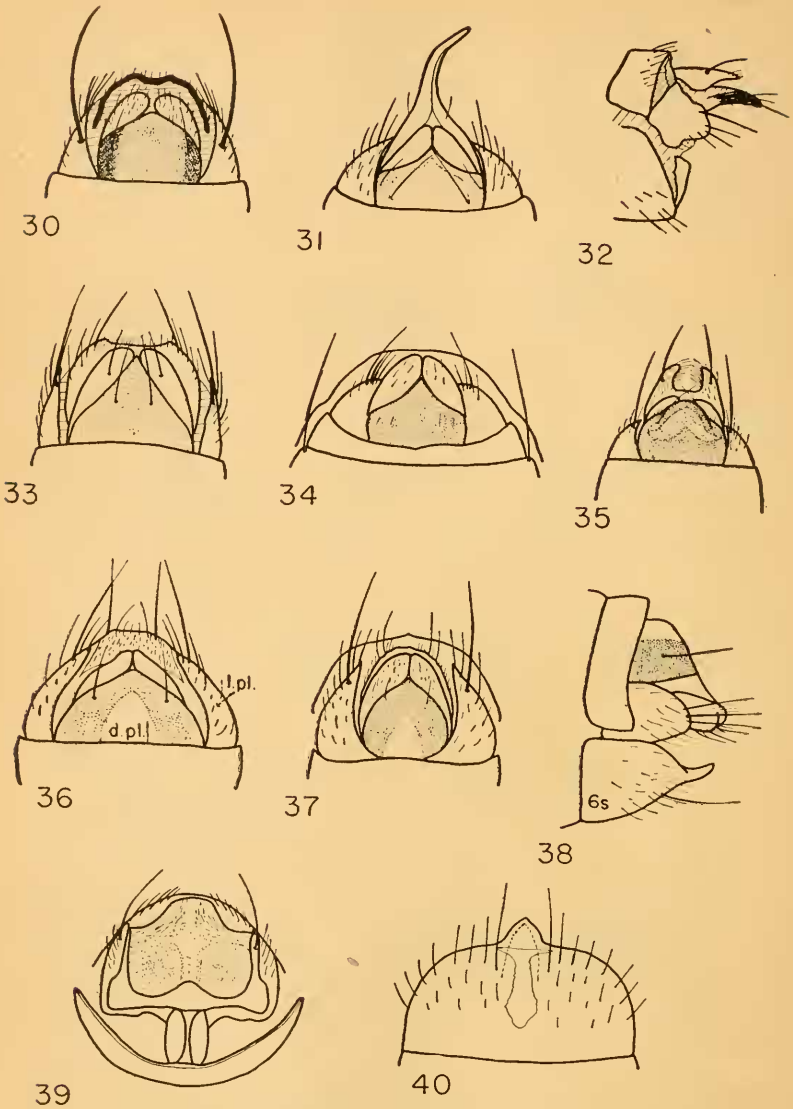


PLATE 3. FEMALE CHARACTERS IN LEPTOCERA

Figs. 30-31, 33-37, dorsal aspect of end of abdomen in *trochanterata* (30), *urodela* (31), *tenaculata* (33), *forceps* (34), *richardsi* (35), *michigana* (36), *barbata* (37); figs. 32, 38, lateral aspect of end of abdomen in *richardsi* (32) and *michigana* (38); fig. 39, posterior aspect of end of abdomen (distended) of *tenaculata*; fig. 40, ventral view of sternite 6 of *michigana*.